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DEVICE FOR THE PROTECTION OF FACILITIES

The invention pertains to a device for the protection of facilities, such as, e.g., buildings, technical installations, nuclear power plants, refineries, and similar against flying objects, which are crashing into them, or are directed at them.

After the collapse of then twin towers of the World Trade Center as a result of the impact of the two passenger airplanes, overtaken by terrorists on September 11, 2001, the question to what extent such a disaster can be prevented in future gained increasingly an importance According to a study, reactor containments of nuclear power plants might not be able to withstand the impact of a large-scale passenger plane. Hence, a target-aimed impact by a hijacked passenger airplane could lead to a large nuclear disaster.

Besides containments of nuclear power plants, other structures or installations can also become targets of terrorist attacks. To these facilities belong high-rise buildings, technical facilities, refineries, and similar. A sufficient protection against airplanes or other crashing or target-directed flying objects does not exist at present.

Hence, the objective to create with simple structural means a device for the protection of facilities, with the help of which device already existing facilities may also be protected against impinging flying objects, forms the basis of the invention.

In accordance with the invention, the set objective is achieved by means of a device for the protection of facilities, which device is having the features of the claim of protection 1. Advantageous refinements of the device for the protection of

facilities are object of the claims of protection 2 thru 14.

As a result of the device for the protection of facilities it is ensured that flying objects, aimed at a facility are destroyed before the flying object collides upon the facility. Existing buildings may be retrofitted with the help of the device for the protection of facilities, using a relatively low input.

In a preferred embodiment form, the retaining device is formed by a horizontal ring, into whose outer circumference the catching elements are connected at uniform interval with one of their ends. On the one hand, the ring can be supported on the facility. However, it is also possible to support the ring by means of supporting pillars on the ground (base).

The catching elements and/or the transverse elements are preferably formed by cables of plastic or wire. Wire cable can be used, as they are preferably used when bridges are constructed, or for aerial cableways.

When the device for the protection of facilities is used for high-rise structures, life-saving cables are preferably provided, which are mounted with one of their ends on a catching element, and are detachably retained on their other end on the facility. These life-saving cables provide an opportunity, e.g., in the case of a fire to also evacuate the upper floors. Moreover, safety belts or similar can be placed at the disposal of those who need them, with the help of which persons can

be attached to the rescue cables. After the persons have left the building by springing out, they hang on the life-saving (rescue) cables, which are attached on the corresponding catching element, In order for the persons to be conveyed to the ground surface, the rescue cables can be attached with one of their ends on a sleigh, which is positionable or traversable on the formed [molded] element. The sleigh is preferably motor-driven, and has a braking or decelerating device. It can also be slowed down by means of a locking brake.

Moreover, it is possible to use the sleigh for other functions. Thus, the sleigh can be used, e.g., for servicing purposes, for the climbing of firemen or rescue-team members, for the mounting of advertisement contraptions, or cameras as well as for the installation of antennas or radio stations, etc.

However, in order for the saved persons to be brought to the ground, a tensile element (element under tensile stress) is mounted in a traversable manner on the catching element, to which a cable under tensile stress (tensile cable) is connected, when one end of the rescue cable can be displaced on the catching element by means of a tensile force, applied by way of the tensile element and the tensile ring.

In order to attenuate the impact of a flying object, the catching element are preferably mounted on the ground by means of an energy-absorption device. For

example, this energy-absorption device can be an elastic tensile device, such as, e.g., a helical (tension) spring. A particularly simple structural device is achieved when the energy-absorption device is formed by a heavy-weight anchor or guy wire, which is displaced if a flying object impinges upon the ground. The energy-absorption devices are so designed that a impingement of the flying object upon the facility to be protected is prevented, however, a contact of the flying object with the facility to be protected is prevented.

However, the catching elements can also be formed by rectangular or square steel bars or by chains.

If a relatively fine-meshed structure is to be achieved, it is also possible to surround the arrangement of the catching elements with a steel network or grid.

Exemplified embodiments of the invention are elucidated in greater detail as follows by means of the drawings wherein

Fig. 1 is a lateral view of a containment of a nuclear power plant, protected by means of the device for the protection of facilities,

Fig. 2 is a top view of the device for the protection of facilities, as depicted in Fig. 1,

Fig. 3 is a high-rise building, protected by a device for the protection of facilities,

Fig. 4 is a sleigh, which is traversable on the catching element.

As shown in Fig. 1, a containment 10 of a nuclear power plant is arranged on the ground (base) 20. Above the containment, a horizontal ring 14 of reinforced concrete is centrally arranged, which is supported on the ground 20 by means of supports or columns (pillars) 18, uniformly distributed along the circumference of the ring. The inner diameter of the ring 14is larger than the outer diameter of the containment 10. On the outer circumference of the ring 14, there are attached - in circumferential direction - a multiple number of catching wire cables 16 with one of their ends attached. The other end of the catching wire cable 16 is attached on a heavy weight anchor (guy wire) 22, which is located radially on the ground 20, outside the ring 14.

As shown in the left half of Fig 1, as well as in the left lower quarter of Fig.2, intersecting cable-like elements 24, which are slantingly passing , are in such a way attached to adjacent catching cable wires 16 that a net-like structure originates between adjacent catching wire cables 16. This net-shaped structure is distributed around the entire containment 10, however, for the sake of clarity, it is partially omitted in Figs 1 and 2.

As can be discerned frm Fig. 2, additional catching wire cables 16 extend inside the ring, which catching wire cables are arranged parallelly to one another at equal interval,, and are attached on the circumference of the ring 14. Array of catching wire-cables 28 extends perpendicularly to the catching wire-cables 26, as a result of which a grid structure, having quadratic meshes, is formed.

If a flying body intentionally or inadvertently impinges laterally upon the device for the protection of facilities, it is destroyed by the catching wire-cables 16 as well as the transverse elements 24, before the said flying object reaches the containment 10. The heavy-weight anchors (guys) 22 can perchance be displaced in the direction of the containment 10, as a result of which an energy absorption is achieved.

Fig. 3 shows a high-rise building 30, which is protected by means of a device for the protection of facilities. The device for the protection of facilities 30 has a retaining ring 34, centrally arranged above the high-rise building 30, which retaining ring 34 is supported on the roof 38 of the high-rise building 30 by means of pillars 36. The outer diameter of the ring 34 extends out laterally beyond the high-rise building 30. Along the circumference of the ring 34, more catching cables 40 are attached at an equal interval with the help of one of their ends. The other end is attached to the ground 44 by means of an energy-absorption device 42. For

example, the energy-absorption device 42 can be a tensile device, having a tension spring, which exerts a stretching or tightening tensile force upon the catching wire-cable 40. As shown in Fig. 4, in the area of the central three catching wire-cables 40, between two adjacent catching wire-cables 40, horizontal transverse cables 46 are connected at an equal interval one above another to two adjacent catching wire-cables 40. For the sake of clarity, the horizontal transverse cables 46, arranged between the additional catching wire cables 40, are omitted in Fig. 4.

By means of the catching wire-cable 40a, which is on the right-hand side of Fig. 4, it is shown that a multiple number of rescue cables 48, arranged one above another, can be mounted with one of their ends on the catching cables 40. The other end of the rescue cable 48 extends to the rescue exits 50 of the high-rise building's 30, which are arranged one above another. For example, in the case of fire, persons can attach themselves to the rescue cables 48 preferably by means of safety belts, and spring out of the rescue exits 50 whereby they are kept in place by the rescue cables 48.

The rescue cables 48 are connected with one of their ends by means of a retaining device 52 to the catching wire-cable 40a, which device is designed in such a way that can be moved by means of a force - formed in the longitudinal direction of the catching cable 40a - but engages on the catching wire-cable 40a,

when only a vertical force is exerted by a person, hanging on the rescue cable 48.

The force, exerted in the longitudinal direction of the catching cable 40a, can exerted by means of a tensile ring 54, arranged above the rescue cable 48, which tensile ring 54 surrounds the catching wire-cable 40a and can slide on it. To the tensile ring, there is attached a hauling (traction) or load cable 56, which can be reached from the ground.

As shown in Fig. 4, the rescue cable 48 can also be attached on a sleigh 60 - having drive rollers 62 - which can slide on a catching cable-wire 40, and which is preferably motor-driven, and has a brake device.

For example, such a sleigh can be used for servicing, for the climbing of firemen or members of a rescue squad, for the mounting of advertisement contraptions or cameras, as well as for the installation of antennas or radio stations.

Instead of being attached to the ground 44, the catching wire-cables 40 can be attached to adjacent buildings. Besides, the facility-protection device 12, 32 also provide a protection against ground vehicles, which - perhaps - are laden with explosives.

Claims of Protection

1. Device for the protection of facilities (10, 30), arranged on the ground (20, 44), or retaining device, supported on the facility(10, 30), which retaining device is arranged as being above the facility (10, 30), or surrounding the upper area of the facility (10, 30), and a multiple number of cable-like catching elements (16, 40), arranged around the facility (10, 30) at an interval from one another, which catching elements are mounted with one of their ends to the retaining device (14, 34), and with the other of their ends - on the ground (20, 44), or close to the ground, whereby horizontal and/or slantingly passing cable-like transverse elements (24, 26) are provided between adjacent catching elements (16, 40).

2. Device as claimed in claim 1, characterized in that the retaining device is formed by a horizontally arranged ring (14, 34), to whose outer circumference the catching elements (16, 40) are connected at equal interval with one of their ends.

3. Device as claimed in one of the preceding claims, characterized in that the catching elements (16, 40) and/or the transverse elements (24, 40) are formed by cables of plastic or wire.

4. Device as claimed in one of the preceding claims, characterized in that rescue cables (48), are mounted with one of their ends on a catching element (16, 40), and are kept detachably on the facility (10, 30) with their other end.

5. Device as claimed in claim 3 or 4, characterized in that a motor-operated sleigh (50) is slidably mounted on the catching element (16, 40).

6. Device as claimed in claim 4, characterized in that the rescue cables (48) are attached with one of their ends on a sleigh (50), which can slide on the catching element (16, 40).

7. Device as claimed in claim 6, characterized in that the sleigh (50) is motor-driven.

8. Device as claimed in claim 3, characterized in that above the rescue cables (48), a hauling (traction) element (54) is movably mounted on the catching element (16, 40), to which a hauling (traction) cable (56) is connected, and one of the ends of the rescue cable (48) can be moved on the catching element (16, 40) as a result of a tensile force, applied in the longitudinal direction of the catching element (16, 40) by means of the hauling (traction) element (54) and the tensile le ring (56).

9. Device as claimed in one of the preceding claims, characterized in that the catching element (16, 40) is mounted by means of an energy-absorption device (24, 42).

10. Device as claimed in claim 9, characterized in that energy-absorption device is an elastic tensile or haulage device (42).

11. Device as claimed in claim 9, characterized in that the energy-absorption

device is formed by a heavy-weight anchor [guy] (24)

12. Device as claimed in one of the preceding claims, characterized in that the catching elements are formed by rectangular or square steel bars articulated with one another.

13. Device as claimed in one of the preceding claims, characterized in that the catching elements are formed by safety catching chains.

14. Device as claimed in claims 1 thru 14 [*sic!*], characterized in that the arrangement of the catching elements is surrounded by a steel net.

Translated from the German by John Koytcheff, M.Sc. (Engrg.)
The USPTO Translator from German & Germanic languages
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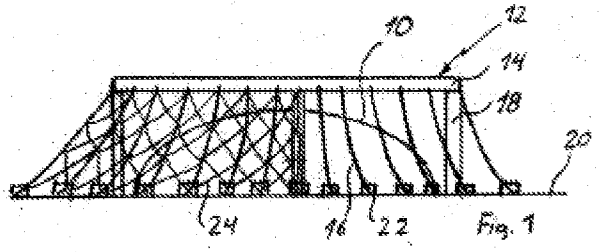

Fig. 1

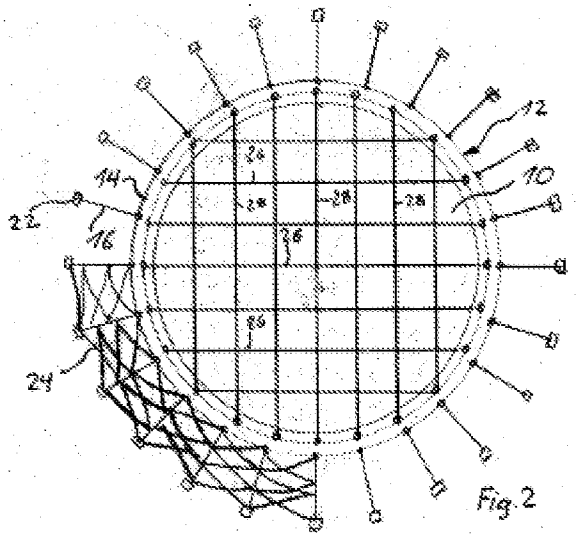

Fig. 2

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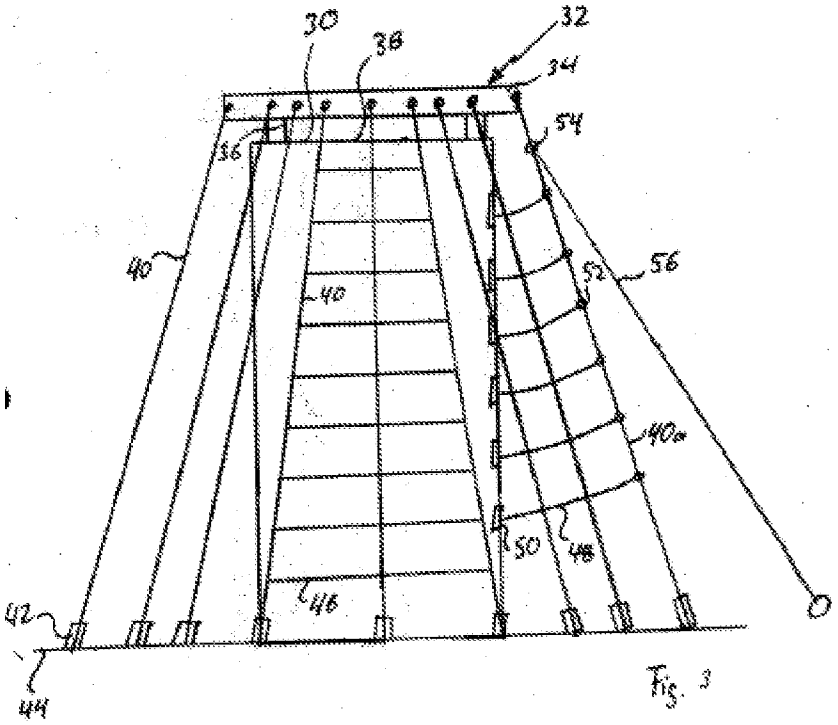

Fig. 3

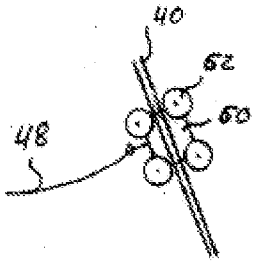

Fig. 4